

RA6W1/RRQ61001 Quick Start Guide

This document is intended to help new or existing developers quickly start evaluating the EK-RA6W1 EVK and using SDK to develop Wi-Fi applications with the RA6W1/RRQ61001 chipset.

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Terms and Definitions

API	Application Program Interface
Arm	Advanced Risk Machine
Bluetooth LE	Bluetooth® Low Energy
COM	Communication Port
CPU	Central Processing Unit

DMP	Dynamic Power Management
EVB	Evaluation Board
EVK	Evaluation Kit
FSP	Flexible Software Package
GCC	GNU Compiler Collection
GPIO	General-Purpose Input/Output
IC	Integrated Circuit
IDE	Integrated Development Environment
MCU	Micro Controller Unit
PMGR	Power Manager
QSPI	Quad Serial Peripheral Interface
RAM	Random Access Memory
ROM	Read Only Memory
RTC	Real Time Clock
RTOS	Real Time Operating System
SD	Secure Digital
SDK	Software Development Kit
SMA	SubMiniature version A
SPI	Serial Peripheral Interface
UART	Universal Asynchronous Receiver/Transmitter
UDP	User Datagram Protocol
WLCSP	Wafer Level Chip Scale Package
WSL	Windows Subsystem for Linux

1. Overview

RA6W1 is a highly integrated ultra-low-power Wi-Fi microcontroller unit(MCU) that allows you to develop Wi - Fi solutions using a single chip. This Getting Started Guide provides an overview of setting up the RA6W1 EVK, Programming the released SDK images, instructions for importing and building images with the sample project template using e² studio Integrated Development Environment (IDE).

The following are the quick guidelines to start using EVK:

- RA6W1 EVK hardware (see [Section 2 Evaluation Kit](#)).
- Setting up the evaluation board (see [Section 3 Set Up RA6W1 EVK](#)).
- Programming firmware image (see [Section 3.1 Program Firmware Image](#)).
- Configuring EK- RA6W1 Serial Debug Interface image (see [Section 3.2 Configure RA6W1 EVK Serial Debug Interface](#)).
- Provisioning Wi-Fi (see [Section 3.3 Provision Wi-Fi](#)).
- Evaluating throughput with iPerf (see [Section 4.1 Test Throughput with iPerf Traffic Generator](#)).
- Measuring current consumption (see [Section 4.2 Measure Current Consumption](#)).

For more **resources**, go to:

- RA6W1 product page (<https://www.renesas.com/en/products/ra6w1>) – documentation, example projects.
- EK-RA6W1 board page (<https://www.renesas.com/en/design-resources/boards-kits/ek-ra6w1>).
- RAFW FSP Examples and Application Notes GitHub repository - <https://github.com/renesas/rafw-fsp-examples/releases>.
- Additional details and advanced topics are covered in the *RA6W1/RRQ61001 Application Development Guide*.

No	Name	Description
7	J219 - PMOD connectors	The socket for plugging in PMOD interface add-on boards. J319 is a header, No mounted. J219 and J319 share some signals which are multiplexed with MikroBUS™. See Figure 5 .
8	J607 - Push-buttons	J607 push-button used to reset Daughterboard, J608/J609/J610 push buttons for general use. See Figure 11 .
9	J2/J102 - Power selection	The current sense circuit option. Using this current measurement circuit, you can monitor the current consumption of Daughterboard through SmartSnippets Toolbox software application.
10	J105/J106/J107 - I/O voltage selection	Selects the I/O voltage applied to the Daughterboard (1.8 V, 3.3 V).
11	U503 - Current sense	The current sense circuit.
12	J3 - SPI interface switch	Selects the I/O voltage generated for the Daughterboard board (1.8 V, 3.3 V). See Figure 14 .
13	U302 - USB interface IC	Provides communication between Daughterboard UART port and PC. It also transfers the current measurement samples to PC.
14	U7 - Level translators	Transfers the data between Daughterboard and FTDI (U302) in proper voltage level.
15	J405 - External J-link connector	Provides access to Wi-Fi MCU or Bluetooth LE MCU. See Figure 6 .
16	U401 – MCU	Place where the SWD implementation of SEGGER applied.
17	J220 - SDIO header	Must be mounted.
18	J601 – Trigger	The trigger signals monitored and presented on SmartSnippets Toolbox. See Figure 12 .
19	U2/U6/U8/U9 - Level translators	For the interface section (PMOD, Android and MikroBUS).
20	J611 – LEDs	Four LEDs are connected to this header. To enable an LED, a jumper wire must be connected between a GPIO and one of the pins of J611.
21	U202 - PSRAM	PSRAM. See Figure 4 .
22	J6 – AIN GND	AIN is a generic Analog Input which is accessible on J6 header.
23	Daughterboard	

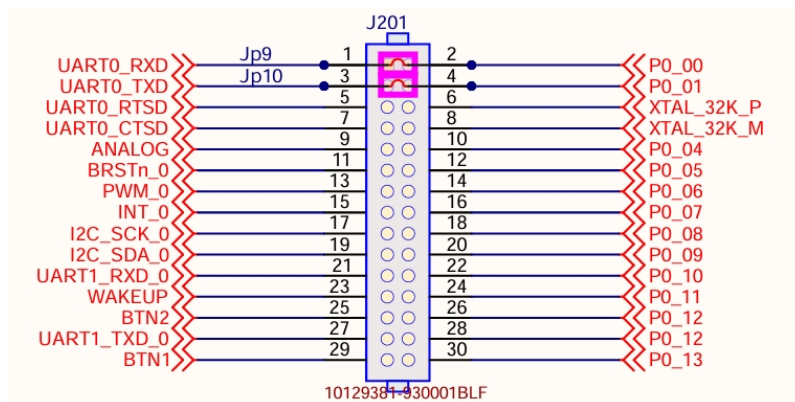


Figure 2. Breakout header J201

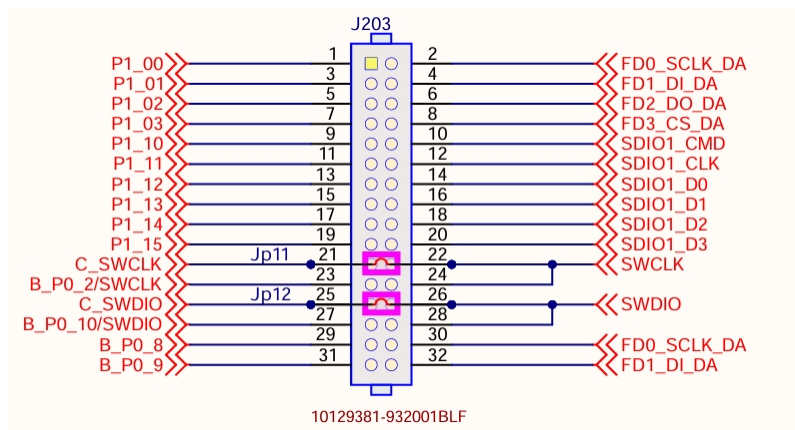


Figure 3. Breakout header J203

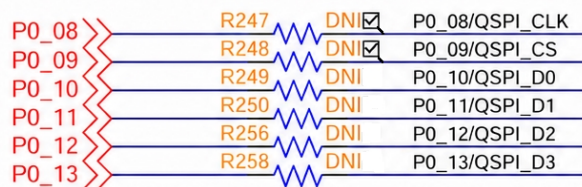
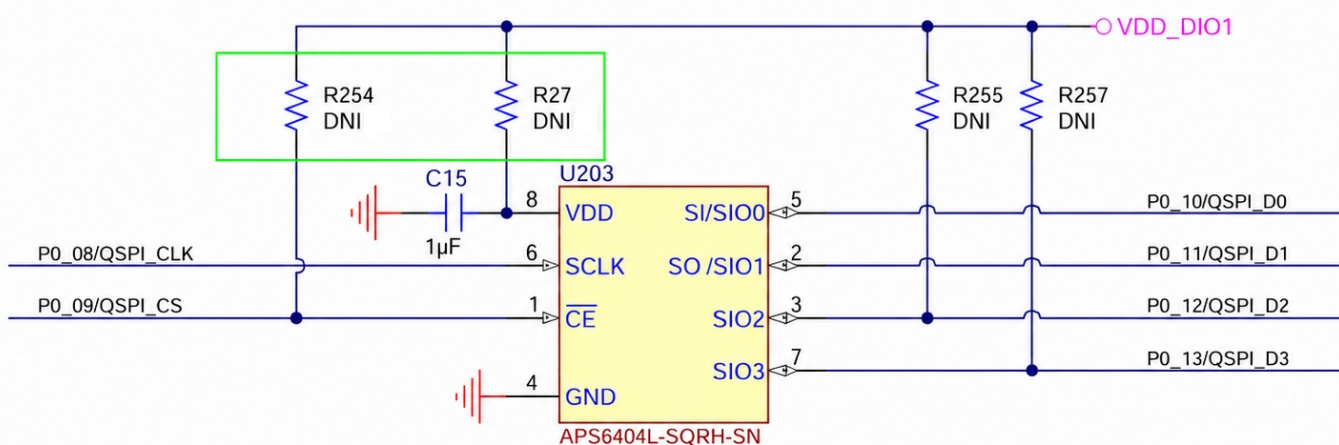


Figure 4. PSRAM

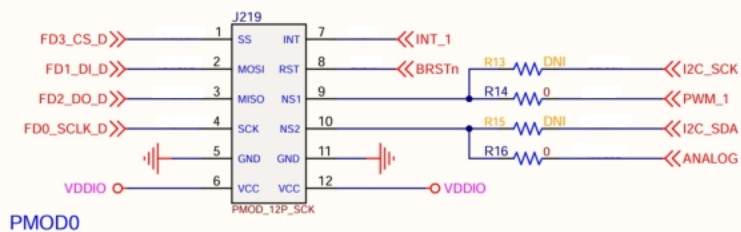


Figure 5. PMOD

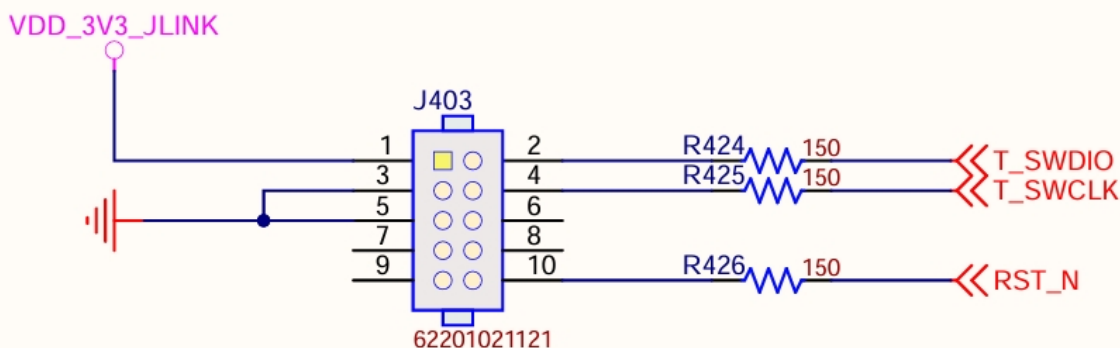
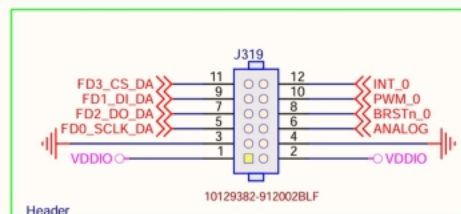


Figure 6. External J-link connector

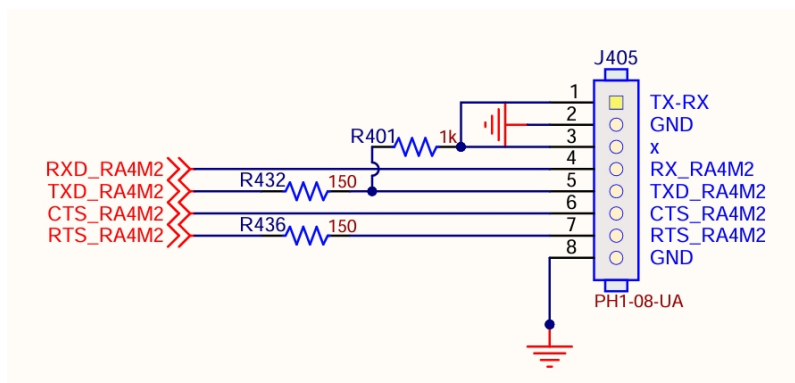


Figure 7. Auxiliary UART

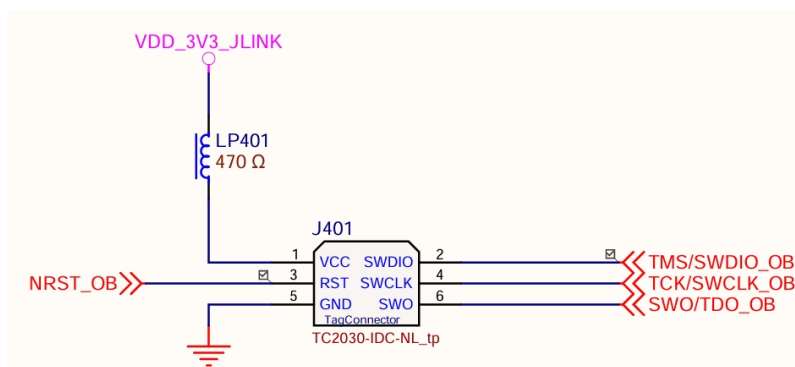


Figure 8. Programming RA4M2

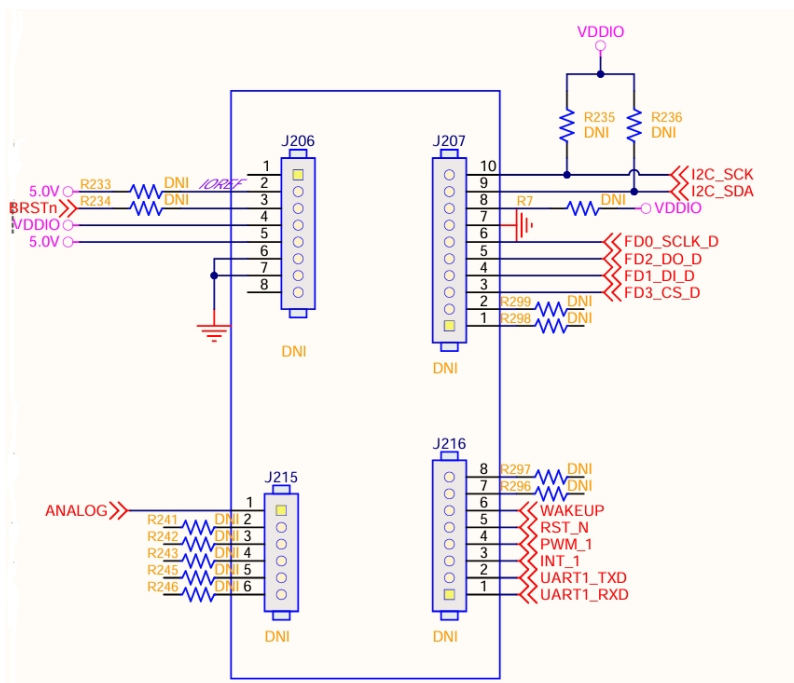
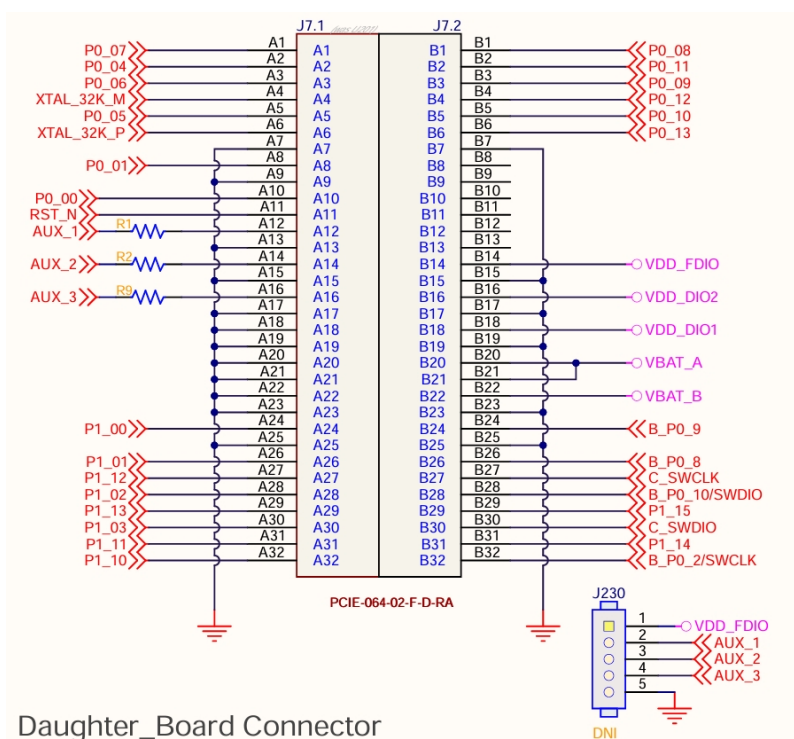


Figure 9. Arduino Interface



Daughter Board Connector

Figure 10. Daughter Board Connector

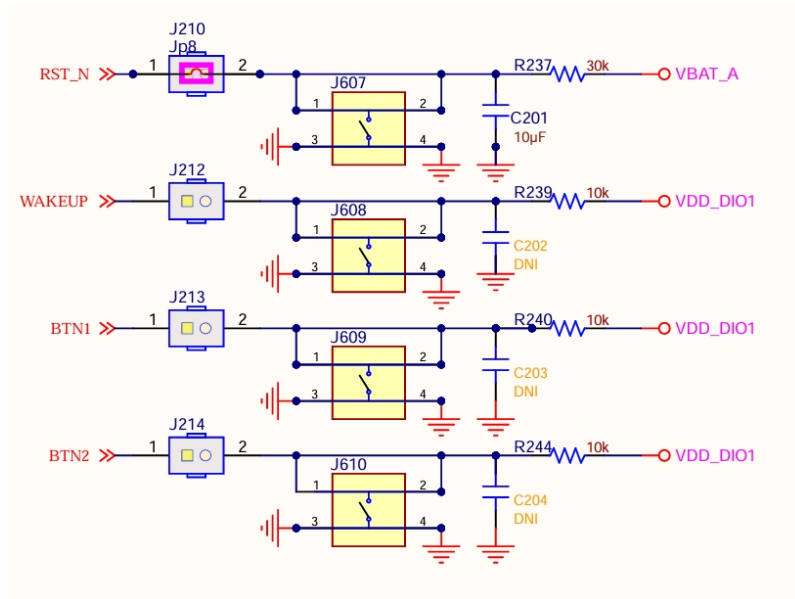


Figure 11. Buttons

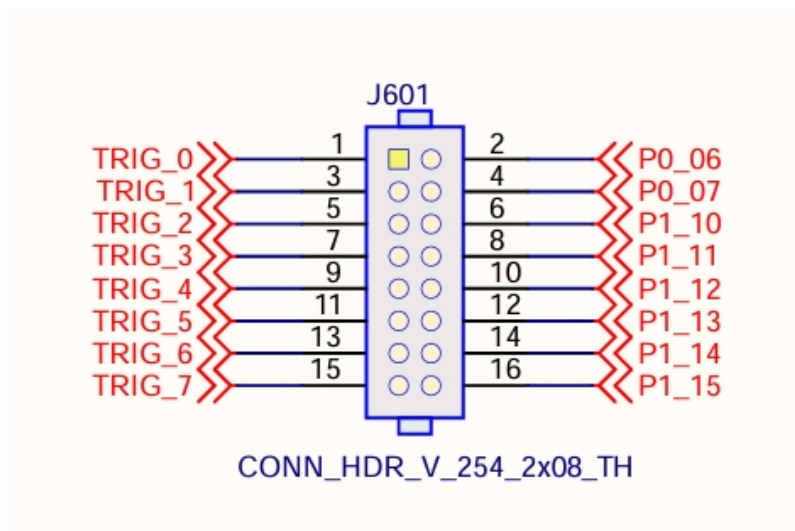


Figure 12. Trigger

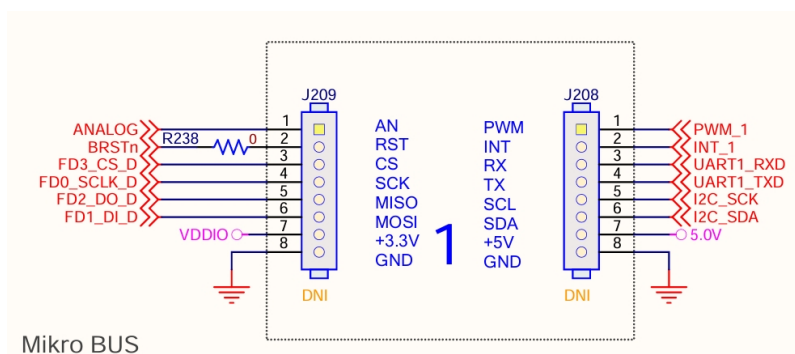


Figure 13. Micro BUS

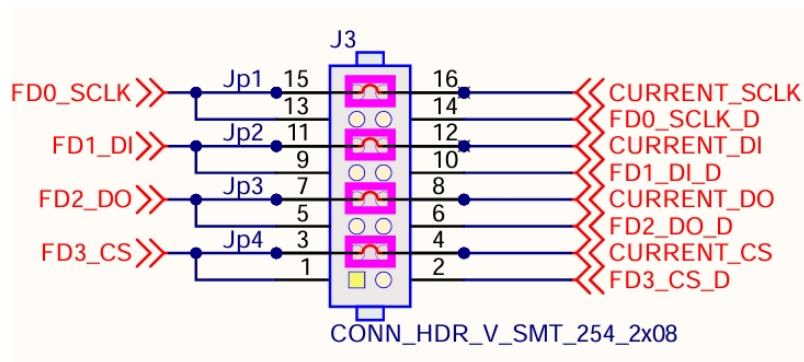


Figure 14. J3

Figure 15 shows the hardware configuration of the daughterboard of RA6W1 EVK.

NOTE

Renesas recommends using a daughterboard with antenna.

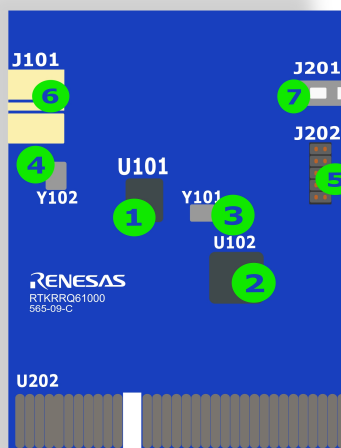


Figure 15. RA6W1 daughterboard

Table 2 shows the components of EK-RA6W1 daughterboard.

Table 2. RA6W1 EVK daughterboard components

No	Name	Description
1	U101 – RA6W1	RA6W1 – WLCSP
2	U102 – Serial flash	Serial flash – AT25SL0641C
3	Y101 – Crystal	40 MHz crystal
4	Y102 – Crystal	32.768 kHz crystal
5	U202 – J-flash connector	J-link for SPI flash connector
6	J101 – SMA connector	SMA connector for external antenna
7	J201 – Reset switch	Switches to reset the RA6W1

3. Set Up RA6W1 EVK

Before setting up ensure that the Evaluation Kit (EVK) and the required software are properly connected and installed. Use the USB cable included in the EVK to connect the host computer and the EVK. When the EVK is connected to the USB port (USB302 on the RA6W1 EVK), the USB Serial COM ports are created.

- For Windows, three USB Serial COM ports are displayed in the device manager (see Figure 16).

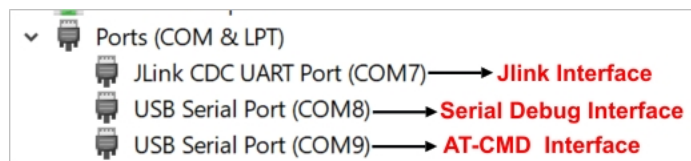


Figure 16. Windows – COM ports

NOTE

If Windows Device Manager displays **Unknown Device**, the FTDI serial driver is not installed. Download the driver by following the URL and installing it manually: <http://www.ftdichip.com/Drivers/>.

The lower numbered J-Link CDC UART Port (COM7, in this case) is the onboard J-Link. The next USB Serial Port (COM8, in this case) is for the RA6W1 debug interface. The higher numbered USB Serial Port (COM9, in this case) is for the RA6W1 AT command interface or current consumption measurement. A serial terminal application can be used for debugging RA6W1.

The **Tera Term** terminal emulator program is recommended and can be downloaded from <https://github.com/TeraTermProject/teraterm/releases/tag/v5.2>.

- For Linux, two Serial COM ports are created. It can be checked using the following command in Terminal.

```
developer:~$ ls /dev/ttyUSB*
developer:~$ /dev/ttyUSB0 /dev/ttyUSB1
```

The lower numbered USB Serial Port (/dev/ttyUSB0, in this case) is for the RA6W1 debug interface. The higher numbered USB Serial Port (/dev/ttyUSB1, in this case) is for the RA6W1 AT command interface or current consumption measurement. A serial terminal application can be used for debugging RA6W1.

Minicom is recommended for Linux and to install minicom on Linux, run this command:

```
developer:~$ sudo apt-get install minicom
```

When the terminal emulation application is installed, connect the USB cable to USB302 on the RA6W1 EVK and start the terminal emulation program. In the terminal emulation program, go to the Serial Port setup and select the preferred COM Port.

3.1 Program Firmware Image

This section describes programming firmware images for Windows.

NOTE

For instructions on programming firmware images for Linux and macOS, see *RA6W1/RRQ61001 Application Development Guide*.

Programming firmware images to the EK-RA6W1 EVK requires the Renesas Flash Programmer (RFP) tool. The RFP provides a graphical interface to flash binary images into the RA6W1 EVK through the on-chip debug interface.

System requirements:

- OS: Windows 11 (64 bit)
- USB drivers (installed along with RFP setup)
- Renesas Flash Programmer V3.22.00 or later
- Hardware: RA6W1 EVK.

To program firmware:

1. Download and launch the Renesas Flash Programmer installer.
2. In the **Software License Agreement** dialog, select **Agree**, then click **Next**.
3. During installation, in the **Windows Security** dialog, to install the Renesas USB driver, select **Always trust software from "Renesas Solutions Corp."**, and click **Install**, and then click **Next**.

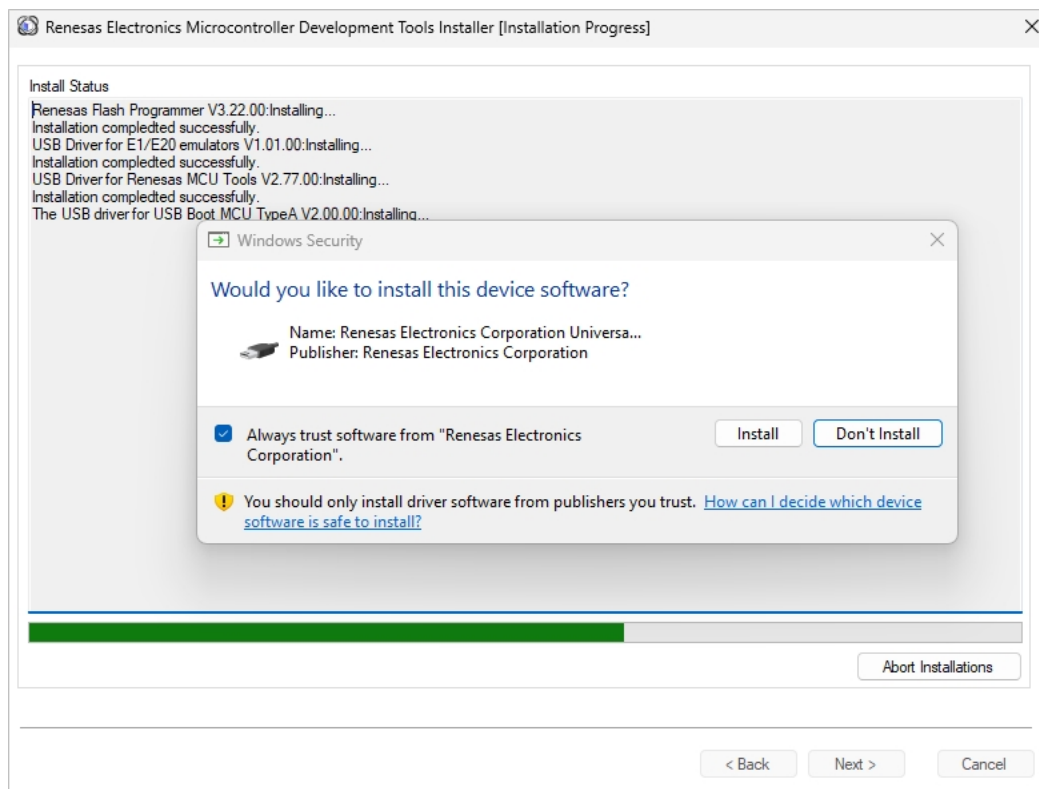
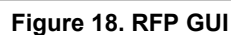


Figure 17. Windows Security prompt for USB driver installation

4. After installation is completed, to exit the setup, click **Finish**.
5. From the Windows Start menu, launch the Renesas Flash Programmer tool.



6. Connect the RA6W1 EVK to the PC using the USB debug interface.



7. In the tool, to create a new project, go to **File > New Project**, and do the following:
 - a. In **Microcontroller**, select the **RA6W1, RA6W2** as the target microcontroller.

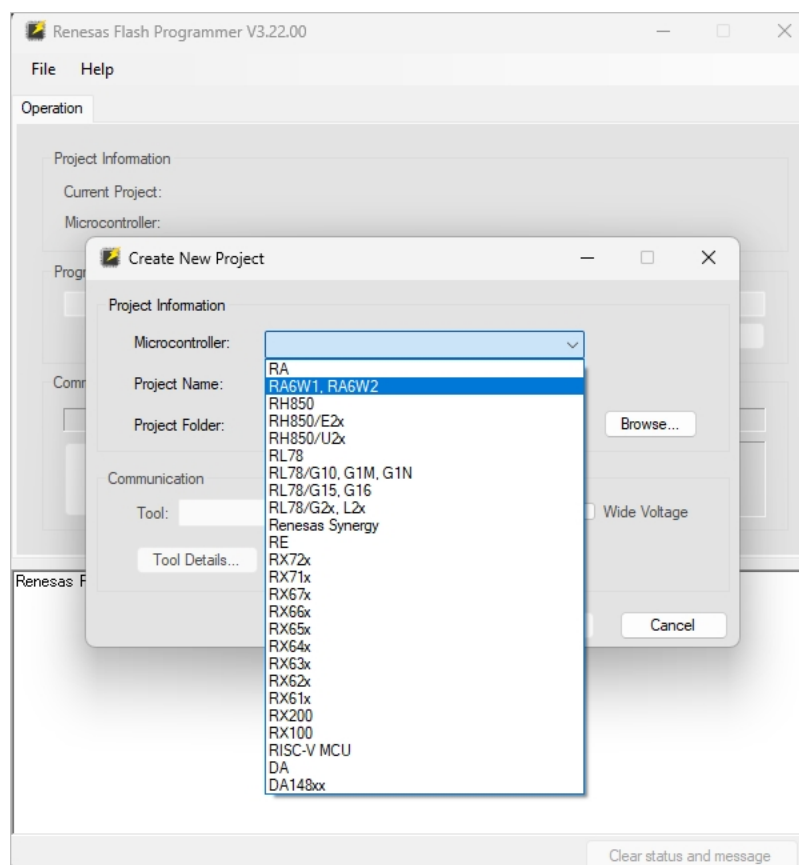


Figure 20. Selecting target microcontroller

- b. In **Project Name**, enter a project name and click **Connect**.

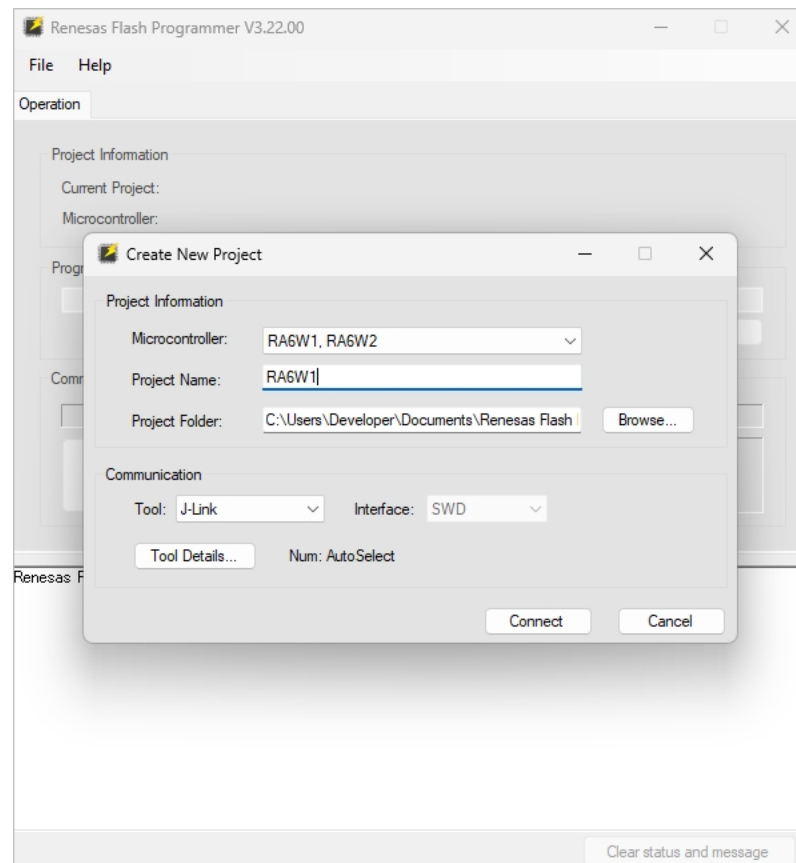


Figure 21. Connecting RA6W1, RA6W2 EVK

After the device is connected, the status message displays **Operation completed**.

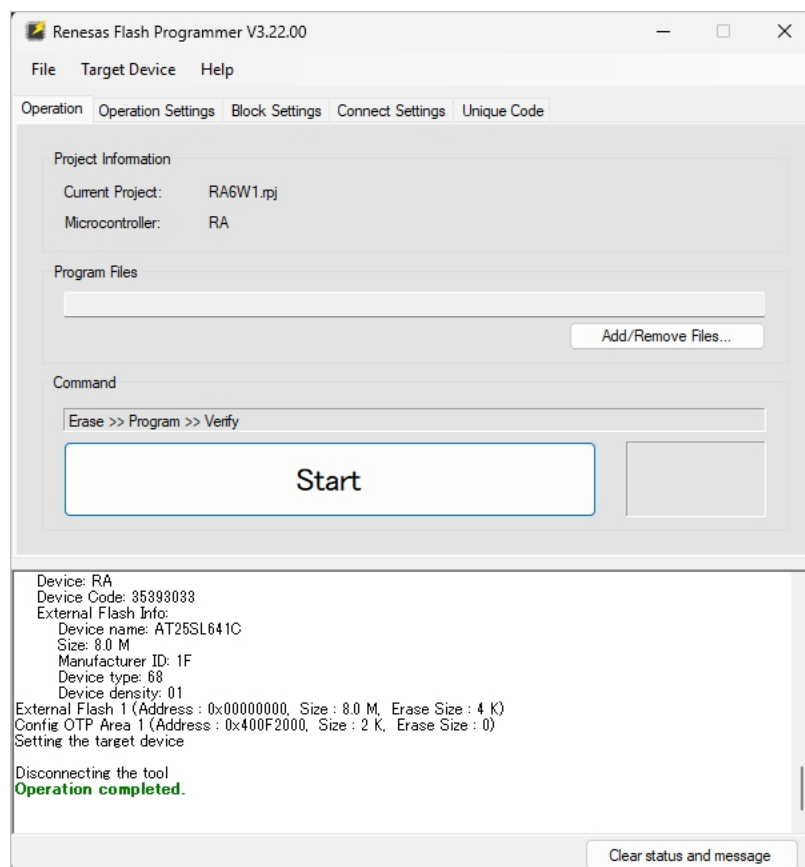


Figure 22. Connection status – operation completed

8. In the **File Details** dialog, to confirm the file selection, click **OK**.

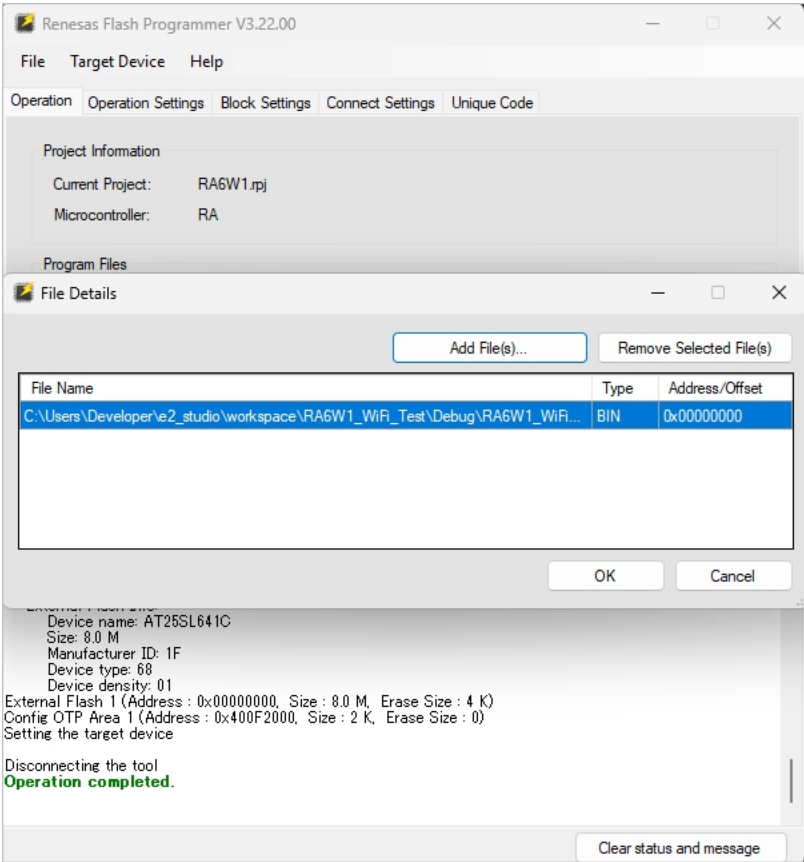


Figure 23. Confirming file selection

9. In **Renesas Flash Programmer**, to flash the image, click **Start**.

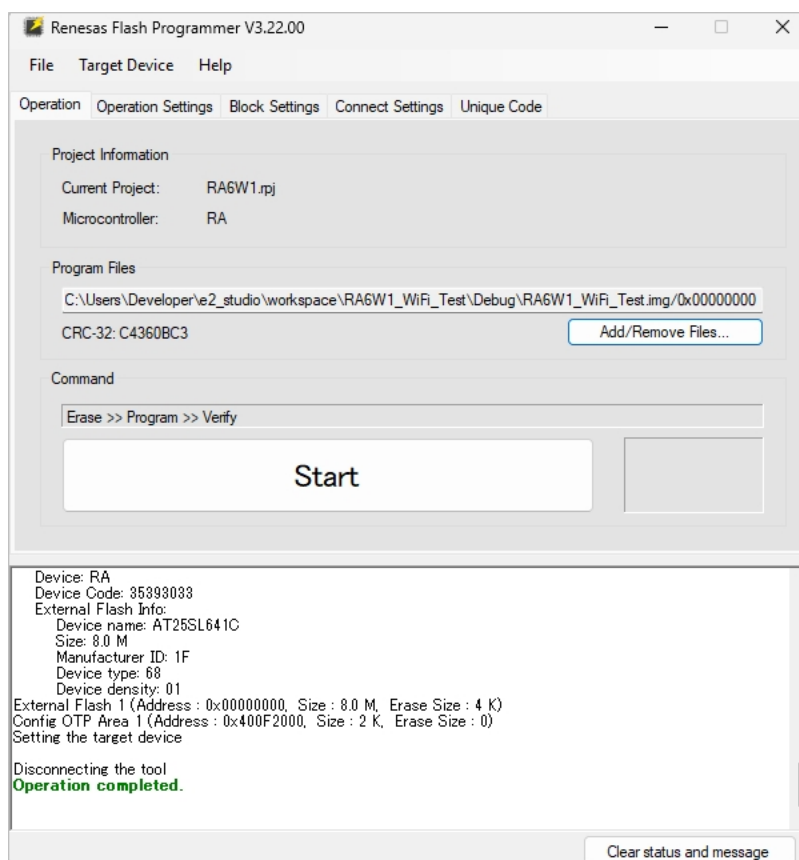


Figure 24. Start programming

The **Progress Report** dialog appears, showing the running progress.

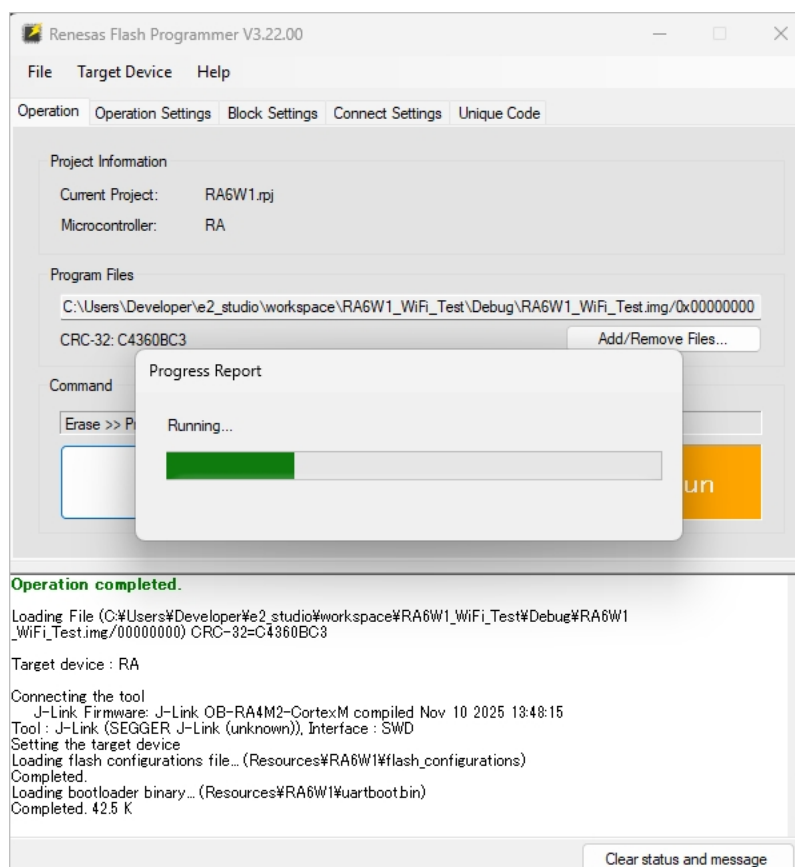


Figure 25. Progress report

When the programming is completed, the status window displays "Operation completed", indicating that the firmware image is successfully written to the RA6W1 EVK.

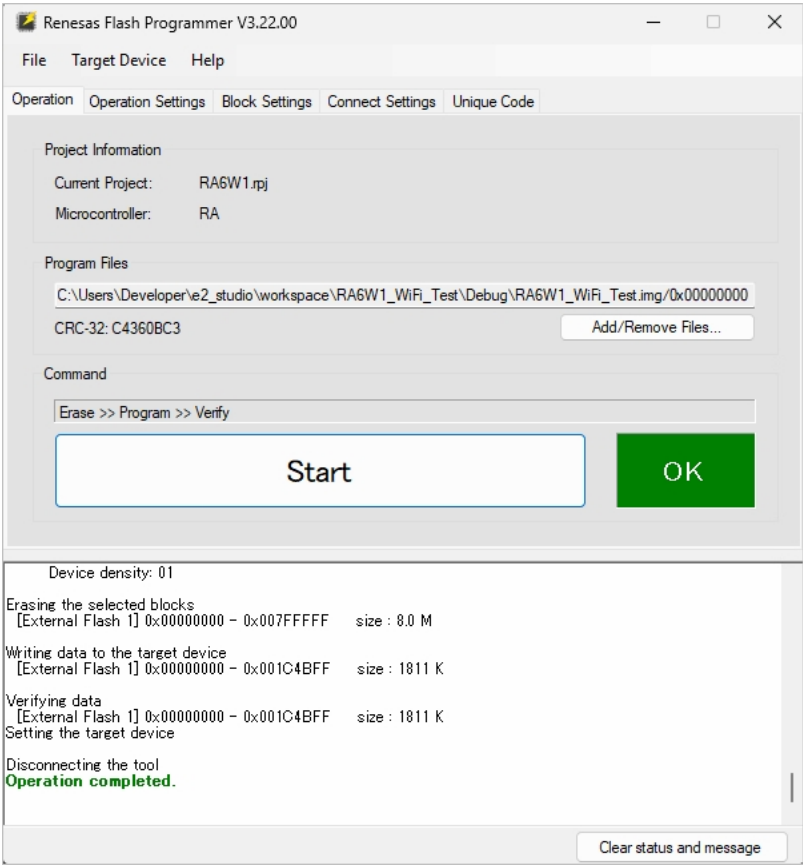


Figure 26. Programming completed successfully

3.2 Configure RA6W1 EVK Serial Debug Interface

The RA6W1 provides a command/debug interface on UART0 for performing configuration and diagnostic functions. Connect the USB cable to the USB debug interface on the RA6W1 EVK and start the terminal emulation program. This section describes configuring Tera Term Serial Terminal Application for Windows.

NOTE

For instructions on configuring Tera Term Serial Terminal Application for Linux and macOS, see *RA6W1/RRQ61001 Application Development Guide*.

To configure Tera Term Serial Terminal Application for Windows:

1. In the Tera Term program, go to the **Serial Port** setup and select the lower numbered COM port (COM8, in this case) and configure it as in [Table 3](#) and [Table 4](#).

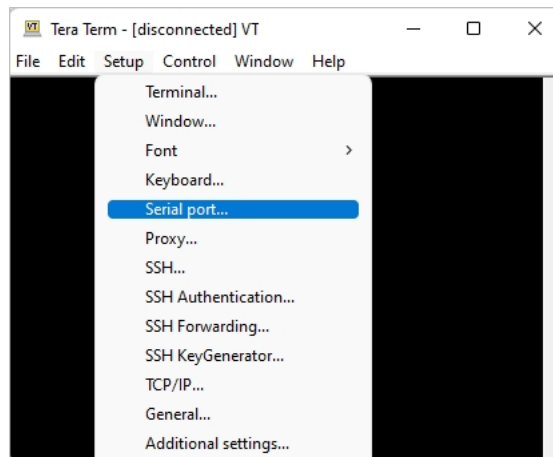


Figure 27. Serial port setup

2. Connect USB cable to RA6W1 EVK and press Enter. The following prompt appears in the UART console:

```
[/RA6W1-RRQ61001]
```

Table 3. Serial port configuration values

Settings	Value
Baud Rate	115200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control (Hardware/Software)	None

Table 4. Terminal settings

Settings	Value
Receive	LF
Transmit	CR + LF

3.2.1 Configure RA6W1 EVK AT Command Interface

3.2.1.1 AT Command Jumper Configuration

For using ATCommands, flash `wifi_test_at_uart_ek_ra6w1_ep.img`.

The following jumper connections are necessary to facilitate the AT command UART connection, see [Figure 28](#).

- Connect **P0_04** on J201 to **FD0_SCLK_DA** on J203
- Connect **P0_05** on J201 to **FD1_DI_DA** on J203
- Connect **FD3_CS** on J3 to **FD3_CS_D** on J3
- Connect **FD2_DO** on J3 to **FD2_DO_D** on J3
- Connect **FD1_DI** on J3 to **FD1_DI_D** on J3
- Connect **FD0_SCLK** on J3 to **FD0_SCLK_D** on J3

After connecting the jumpers, connect the RA6W1 to laptop through USB cable to access the AT command terminal.



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You can configure the Wi-Fi functions of the RA6W1 by running the Easy Setup Wi-Fi configuration wizard.

NOTE

In case of factory reset, the Easy Setup Wi-Fi configuration wizard appears and guides you through the setup steps. If reconfiguring, complete the following steps.

To configure the RA6W1 for operating in Station mode, open its debug console and run the `setup` command at the `[/RA6W1-RRQ61001]` prompt. To complete the setup, follow the following prompts:

```
[/RA6W1-RRQ61001] # setup                                //Start the Easy Setup Wizard.

Stop all services for the setting.
Are you sure ? [Yes/No] : Y                               //Enter Y to stop the services.

[RA6W1-RRQ61001 EASY SETUP - V4]

Country Code List:
AD AE AF AI AL AM AN AR AS AT AU AW AZ BA BB BD BE BF BG BH
BL BM BN BO BR BS BT BY BZ CA CF CH CI CL CN CO CR CU CX CY
CZ DE DK DM DO DZ EC EE EG ES ET EU FI FM FR GA GB GD GE GF
GH GL GP GR GT GU GY HK HN HR HT HU ID IE IL IN IR IS IT JM
JO JP KE KH KN KP KR KW KY KZ LB LC LI LK LS LT LU LV MA MC
MD ME MF MH MK MN MO MP MQ MR MT MU MV MW MX MY NG NI NL NO
NP NZ OM PA PE PF PG PH PK PL PM PR PT PW PY QA RE RO RS RU
RW SA SE SG SI SK SN SR SV SY TC TD TG TH TN TR TT TW TZ UA
UG UK US UY UZ VA VC VE VI VN VU WF WS YE YT ZA ZW ZZ

COUNTRY CODE ? [Quit] (Default KR, ZZ : for debug) : KR    // Enter the country code.

SYSMODE(WLAN MODE) ?
  1. Station
  2. Soft-AP
  3. WiFi Direct
  4. WiFi Direct P2P GO Fixed
  5. Station & Soft-AP
MODE ? [1/2/3/4/5/Quit] (Default Station) : 1              // Enter 1 for Station mode.

BAND ?
  1. 2.4 GHz
  2. 5 GHz
  3. AUTO
BAND ? [1/2/3/Quit] (Default 3. AUTO) : 1                  // Choose WiFi Frequency Band.

[ STATION CONFIGURATION ]
=====
[NO] [SSID]                                [SIGNAL] [CH] [SECURITY]
-----
[ 0] ASUS_TPT_24G                          -48    1      WPA2
[ 1] ASUS_KEYSGT_24G                       -50   11      WPA2
[ 2] SK_WiFiGIG_24G                        -54    6      WPA3
[ 3] ASUS_JIT_EAP_24G                      -56    6 WPA + WPA2 ENT
[ 4] DIRECT-GM2020                         -66   11 WPA2 + WPA3
[ 5] olleh_WiFi_B602                       -67    6      WPA2
[ 6] KT_GiGA_2G_Wave2_04A                  -70    6      WPA2
[ 7] Vantest24g                           -79    6      OPEN
[ 8] [Hidden]                             -81    6      WPA2
-----
[Enter] Rescan
=====

Select SSID ? (0~8/Manual/Quit) : 0                      // Enter the SSID NO from the list.

PSK-KEY(ASCII characters 8~63 or Hexadecimal characters 64) ? [Quit]
```



```

*****                                     // Enter the password for the AP.

Do you want to set advanced WiFi configuration ? [No/Yes/Quit] (Default No) : N
                                                    // Enter N to skip this step.
Enable DPM (Dynamic Power Management) ? [Yes/No/Manual/Quit] : N

=====
BAND      : 2.4 GHz
SSID      : ASUS_TPT_24G
Security  : WPA2PSK
ENCRYPTION : AES(CCMP)
Password  : *****
PMF       : Default
=====
WIFI CONFIGURATION CONFIRM ? [Yes/No/Quit] : Y                // Enter Y to confirm the
configuration.

IP Connection Type ? [Automatic IP/Static IP/Quit] : A          // Enter A for automatic DHCP IP
address.

IP Connection Type: Automatic IP
IP CONFIGURATION CONFIRM ? [Yes/No/Quit] : Y                // Enter Y to confirm the
configuration.

SNTP Client enable ? [Yes/No/Quit] : N                        // Enter N to disable time sync.

[/RA6W1-RRQ61001] #
Connection COMPLETE to cc:28:aa:7f:02:48

>>> Network Interface (wlan0) : UP
    Assigned addr   : 192.168.50.130
        netmask    : 255.255.255.0
        gateway    : 192.168.50.1
    DHCP Server IP  : 192.168.50.1
    Lease Time      : 24h 00m 00s
    Renewal Time    : 12h 00m 00s

```

The configuration is now completed and stored in NVRAM. For configuring different Wi-Fi modes, see RA6W1/RRQ61001 Application Development Guide.

4. Test Procedures

The following sections describe several tests that verify the proper operation of the RA6W1 and demonstrates its various features.

The tests include:

- **Throughput Test** – demonstrates the Wi-Fi performance of the RA6W1.
- **Current Consumption Measurements** – demonstrates the amount of power used when the RA6W1 is in various Sleep modes or in Operational DPM mode.

4.1 Test Throughput with iPerf Traffic Generator

iPerf is a free IP-based traffic generator tool that can be used for active measurements of the maximum achievable bandwidth on IP networks.

iPerf 2.1.3 (recommended) for Windows and Linux can be downloaded from

<https://sourceforge.net/projects/iperf2/files/>.

There are various test setup types that can be used for Wi-Fi throughput tests:

- **Conducted** – uses RF cables to connect the communicating devices. This effectively eliminates issues caused by the wireless domain.
- **Wireless/Over the Air** – uses antennas connected to the station and access point, as opposed to RF cables, thus introducing additional elements and better replicating real-life usage.
- **Hybrid (Wireless plus Attenuation Control)** – is the same as a wireless test setup, using antennas, but digital attenuators are also introduced as part of the signal path between the AP's RF ports and antennas. This allows for total control over the RSSI, replicating varying distance between the Access Point and Station.

The provided examples work in any of the above scenarios.

NOTE

For clean and accurate results, Renesas recommends using an anechoic RF chamber for any of the mentioned tests. Also use a dedicated Access Point for tests. If iPerf does not work and the issue is related to firewall restrictions, contact IT department.

4.1.1 Configure Testbed

To configure the Testbed:

1. Download iPerf 2.1.3 from <https://sourceforge.net/projects/iperf2/files/>.
2. Create a folder called "iperf" in the C:\ directory.
3. Unzip the downloaded iPerf file (if necessary) and move the contents to the "iperf" folder.
4. Rename the downloaded iperf executable file from "iperf-2.1.3-win.exe" to "iperf.exe".
5. To ensure stable iPerf testing, run the Windows Security APP and turn off the network firewall. It is recommended to disable the laptop from all network firewalls before attempting a test.

To set up the Test Environment after setting up the iPerf:

1. Connect your computer to the LAN port of an Access Point (such as the Asus RT-AX88U) through an ethernet cable.
The computer should receive an automatic IP address from the Access Points DHCP server. If the Access Point is configured to not provide automatic IP addresses, make sure to manually configure your computer to use a suitable IP address and subnet mask. Make sure that the computer is not connected to any other networks over ethernet or Wi-Fi.
2. Connect EK-RA6W1 EVK wirelessly to the same Access Point SSID (for instructions on how to configure the Wi-Fi connection for the RA6W1, see [Section 3.3.2 Setup for Station Mode](#)).
3. To verify a properly configured connection, ping the RA6W1 from your computer or ping it from the RA6W1 to your computer.

```
net
ping <destination IP address>
```

4.1.2 Configure RA6W1 EVK as iPerf Client

The provided UDP uplink iPerf example can be used to primarily evaluate TX throughput speeds.

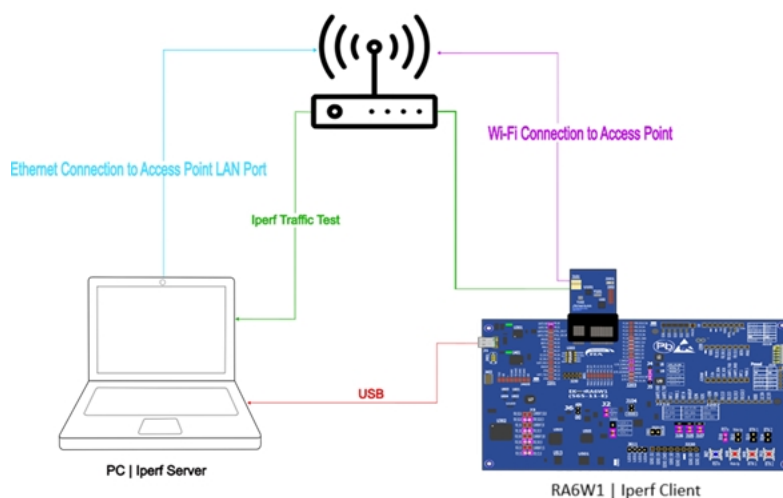


Figure 29. UDP uplink iPerf example

To configure as iPerf server for Windows:

1. Start an iPerf Server on your laptop by opening the command prompt and navigating to the directory in which iPerf is located.
2. Type "ipconfig" in the command prompt to see your laptop's IP address.

```
Ethernet adapter Ethernet:

    Connection-specific DNS Suffix  . : thinkpalm.lan
    Link-local IPv6 Address . . . . . : fe80::343:1650:a9:29f6%14
    IPv4 Address. . . . . : 172.27.10.72
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 172.27.10.100
```

Figure 30. IP address

3. Start the UDP server in the Windows command prompt.

```
iperf.exe -s -i1 -u
```

```
C:\Users\itamar.ben.amitai\Downloads\iperf-2.0.10-win>iperf.exe -s -i1 -u
-----
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size: 64.0 KByte (default)
-----
```

Figure 31. Start UDP

To run traffic from the RA6W1 EVK to the iPerf server on the Windows computer:

1. Select the network Command mode, in the **Tera Term** console, by typing the `net` command.
2. Start the UDPclient:

NOTE

The `i1` option in the `iperf` command is a Renesas embedded-CLI custom flag and is supported only on the RA6W1/RA6W2 device. Do not use the `i1` option when running `iperf` on the Windows host.

```
iperf -I WLAN0 -c <Server IP> -t 10 -i 1 -u
```

3. Read the throughput measurements from the iPerf server window.

```
C:\Users\itamar.ben.amitai\Downloads\iperf-2.0.10-win>iperf.exe -s -i1 -u
-----
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size: 64.0 KByte (default)
-----
[364] local 10.0.0.9 port 5001 connected with 10.0.0.5 port 49297
[ ID] Interval      Transfer    Bandwidth   Jitter     Lost/Total Datagrams
[364] 0.0- 1.0 sec  1021 KBytes 8.36 Mbits/sec 2.360 ms    0/ 711 (0%)
[364] 1.0- 2.0 sec  1.06 MBytes 8.88 Mbits/sec 1.881 ms    4/ 759 (0.53%)
[364] 2.0- 3.0 sec   795 KBytes 6.52 Mbits/sec 1.144 ms    4/ 558 (0.72%)
[364] 3.0- 4.0 sec  1.11 MBytes 9.29 Mbits/sec 3.610 ms    0/ 790 (0%)
[364] 4.0- 5.0 sec  1.23 MBytes 10.3 Mbits/sec 2.575 ms    0/ 878 (0%)
[364] 5.0- 6.0 sec   711 KBytes 5.82 Mbits/sec 3.087 ms    8/ 503 (1.6%)
[364] 6.0- 7.0 sec   991 KBytes 8.11 Mbits/sec 4.242 ms    0/ 690 (0%)
[364] 7.0- 8.0 sec  1.23 MBytes 10.3 Mbits/sec 3.405 ms    0/ 876 (0%)
[364] 8.0- 9.0 sec   712 KBytes 5.83 Mbits/sec 4.903 ms    3/ 499 (0.6%)
[364] 9.0-10.0 sec  1.20 MBytes 10.1 Mbits/sec 2.946 ms    0/ 855 (0%)
[364] 0.0-10.1 sec 10.1 MBytes 8.36 Mbits/sec 9.263 ms 2147469244/2147476436 (1e+002%)
```

Figure 32. Measurements

4.1.3 Configure RA6W1 EVK as iPerf Server

The provided UDP downlink iPerf example can be used to primarily evaluate RX throughput speeds.

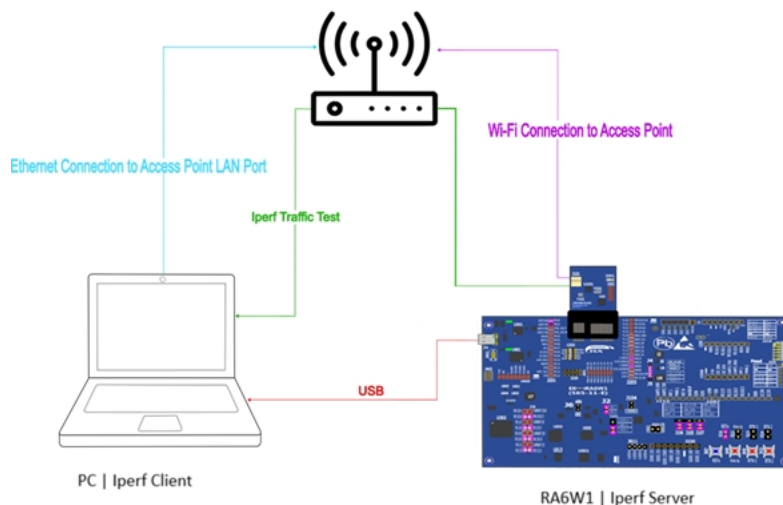


Figure 33. UDP downlink iPerf example

To configure RA6W1 EVK as iPerf Server:

1. Select the network command mode, by typing the net command in the **Tera Term** console.
2. Start the UDP server:

NOTE

The i1 option in the `iperf` command is a Renesas embedded-CLI custom flag and is supported only on the RA6W1/RA6W2 device. Do not use the i1 option when running `iperf` on the Windows host.

```
iperf -I WLAN0 -s -u -i 1
```

```
[/RA6W1-RRQ61001/net] # iperf -I WLAN0 -s -u -i 1
iPerf Server(UDP): Ready
[/RA6W1-RRQ61001/net] #
```

Figure 34. Start UDP

3. Close the existing command prompt on the laptop running the UDP server.
4. Open the command prompt and navigate to the directory where iPerf is located.
5. Start the UDP client in the Windows command prompt:

```
iperf -I WLAN0 -c <Server IP> -t 10 -i 1 -u
```

```
C:\Users\itamar.ben.amitai\Downloads\iperf-2.0.10-win>iperf.exe -c 10.0.0.5 -t 10 -i 1 -u
-----
Client connecting to 10.0.0.5, UDP port 5001
Sending 1470 byte datagrams, IPG target: 11215.21 us (kalman adjust)
UDP buffer size: 64.0 KByte (default)
-----
[360] local 10.0.0.9 port 50756 connected with 10.0.0.5 port 5001
[ ID] Interval      Transfer    Bandwidth
```

Figure 35. Start UDP client

4.2 Measure Current Consumption

NOTE

Current consumption measurement through SmartSnippets Toolbox is possible with the latest Evaluation Kit.

There are numerous available methods to measure current consumption to evaluate the power save performance of different sleep and DPM configurations.

The following instructions explain how to perform such measurements using the SmartSnippets Toolbox ([Section 4.2.2 Measure with SmartSnippets](#)) or a standard power analyzer ([Section 4.2.3 Measure with Power Analyzer](#)) and focus measuring current consumption in forced Sleep modes and DPM mode.

4.2.1 PMGR Sleep Mode CLI Commands

RA6W1 can be configured to temporarily enter Power Manager (PMGR) Sleep modes 2 to Sleep mode 3 for a specified duration (range from 1 second to 2073600 seconds) through CLI commands:

```
[/RA6W1-RRQ61001/pmgr] # pmgr force
- Usage: force [lld_states: PMGR_LLD_POWER_MODE_SLEEP2, PMGR_LLD_POWER_MODE_SLEEP3, PMGR_LLD_POWER_
MODE_SLEEP4, PMGR_LLD_POWER_MODE_DPM, PMGR_LLD_POWER_MODE_CPU_WFI, PMGR_LLD_POWER_MODE_AUTO]
[/RA6W1-RRQ61001/pmgr] #
```

Example:

```
pmgr force PMGR_LLD_POWER_MODE_SLEEP3 <duration>
```

To prepare SmartSnippets Toolbox:

1. Download and install the latest version of the SmartSnippets Toolbox for current measurement from the Renesas Product webpage or from the provided evaluation Software package.

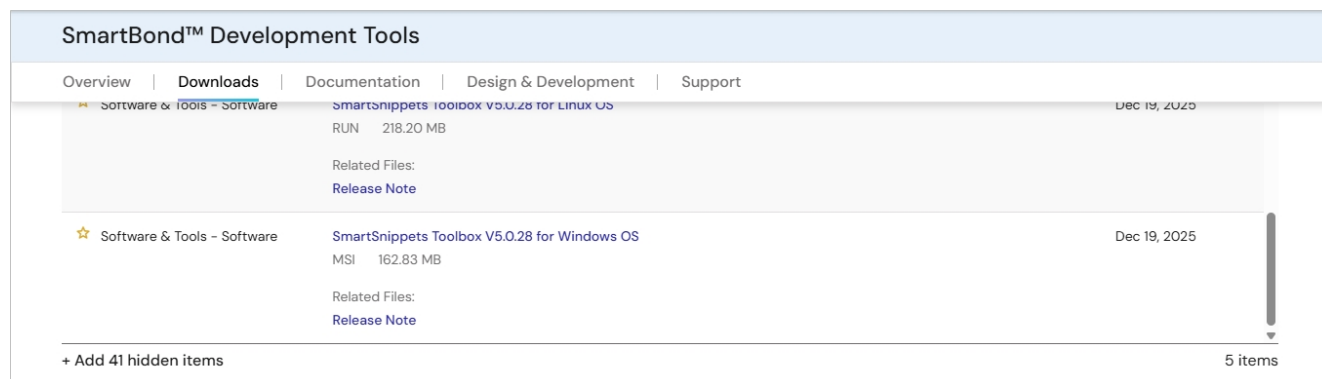
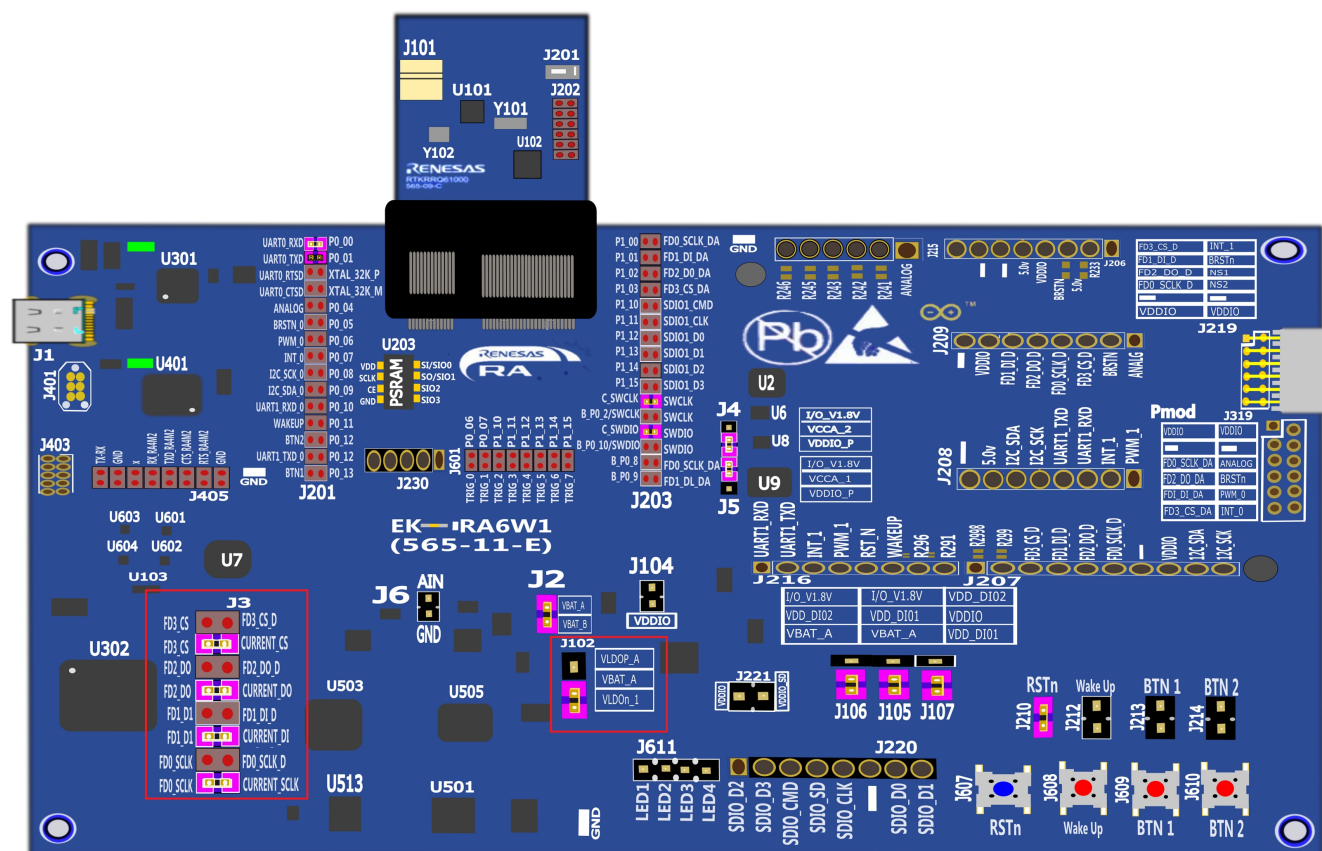


Figure 36. SmartSnippets toolbox

2. Connect jumpers between the pins highlighted in red in Figure 37. LED light turns on when jumper J102 is set.



4.2.2 Measure with SmartSnippets

To measure the current consumption with SmartSnippets:

1. Disassemble the RA6W1 daughterboard from the motherboard and power up the EVK through USB to your computer.
2. Close any open instances of the UART COM port.
3. Open SmartSnippets Toolbox on your computer.
4. Select **Board > Device > RA6W1**.

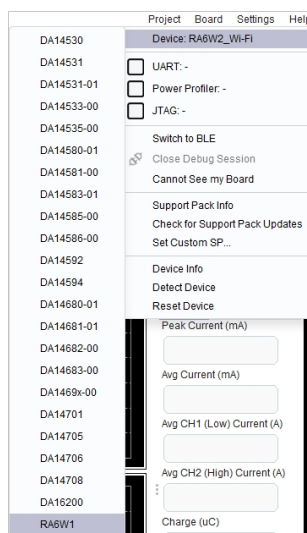


Figure 38. RA6W1

5. On the **Chart View** tab, select **VBAT_WI-FI** and **CH1/CH2 Charge** checkboxes.

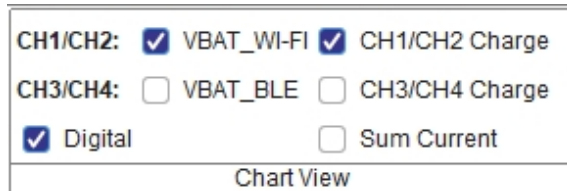


Figure 39. Chart View tab

You should see the VBAT Wi-Fi – CH1/CH2 current measurement window.

6. Identify the RA6W1 EVK -related COM ports through the Windows Device Manager.
7. Based on the identified pair of COM ports belonging to the RA6W1 EVK (in this case COM21 and COM22), select the following configurations:
 - a. Select **Board > PowerProfiler >** (Higher-numbered COM port).

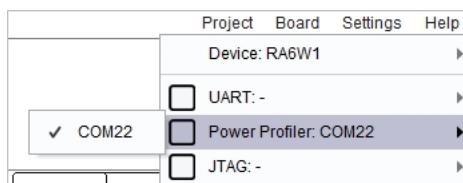


Figure 40. Power profiler port

- b. Select **OffsetCalibration > CH1/CH2** in SmartSnippets.

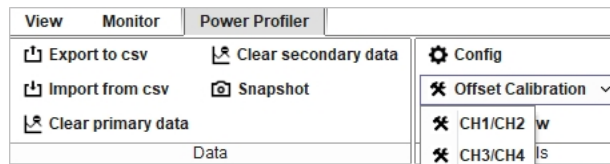
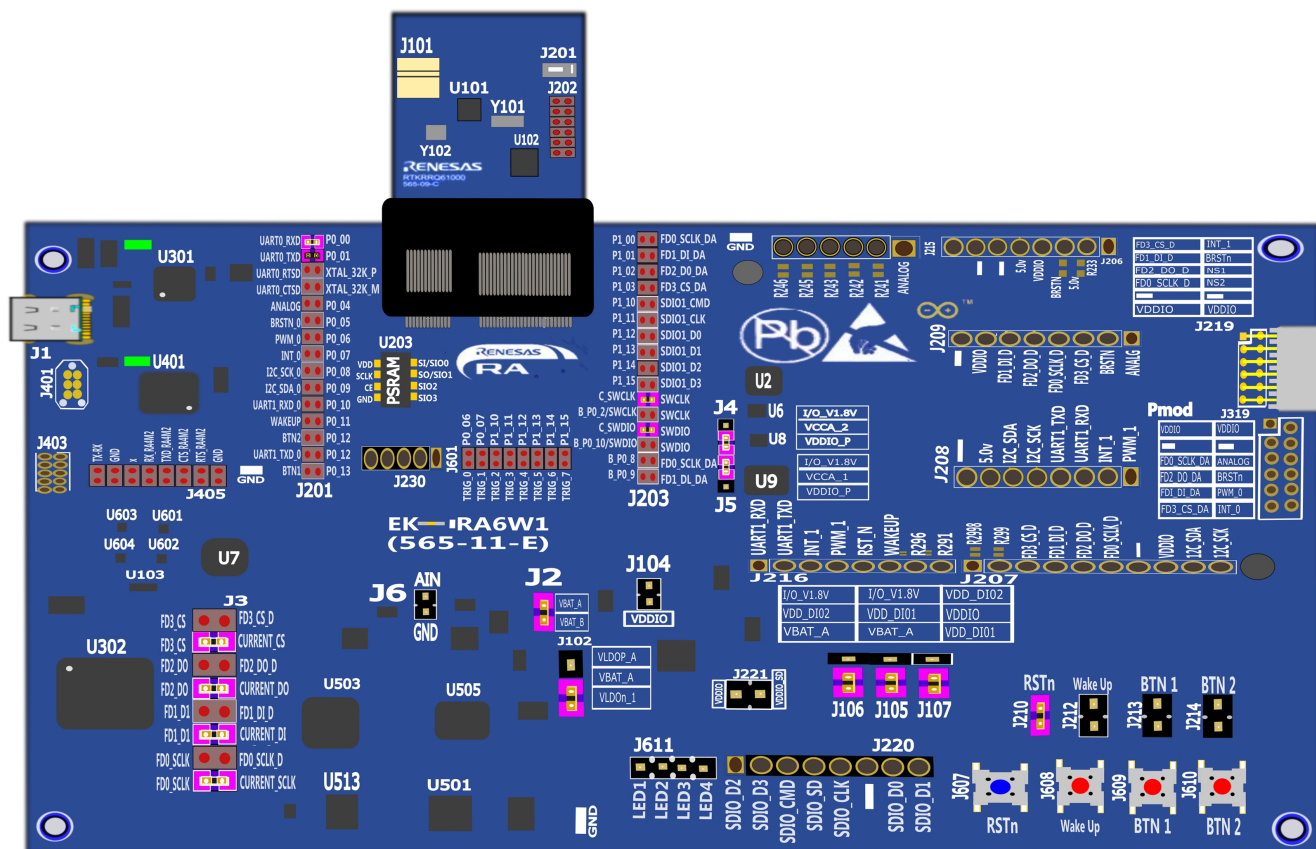


Figure 41. Offset calibration

c. **NOTE**

Offset calibration is required to find the current consumption values of motherboard before inserting daughterboard. This way the measurement of daughterboard is accurate. Calibration takes 10 seconds, and the values are saved in the configuration.

8. Connect the RA6W1 EVK daughterboard to the motherboard.



10. In SmartSnippets, select **Start**.
11. Connect to the console through UART using Tera Term, see [Section 3.2 Configure RA6W1 EVK Serial Debug Interface](#).
12. In the UART console, select the needed configuration:
 Example:
 Configure the RA6W1 as in **Station + DPM mode** (for details on Station mode with DPM, see *RA6W1/RRQ61001 Application Development Guide*).
 //OR//
 Enter **forced sleep modes (2 or 3)** by using the following command syntax: "pmgr force <mode>"

```
pmgr force PMGR_LLD_POWER_MODE_SLEEP3
```
13. In SmartSnippets, select **Stop**.
14. To measure the average current consumption over a selected period, on the **Tools** tab, click **Measure**.
15. Click and drag the measurement cursor over the section that you want measure in the top screen (CH1/CH2 Current – VBAT) and read the "Iav" measurement for the average current between the selected measurement points.

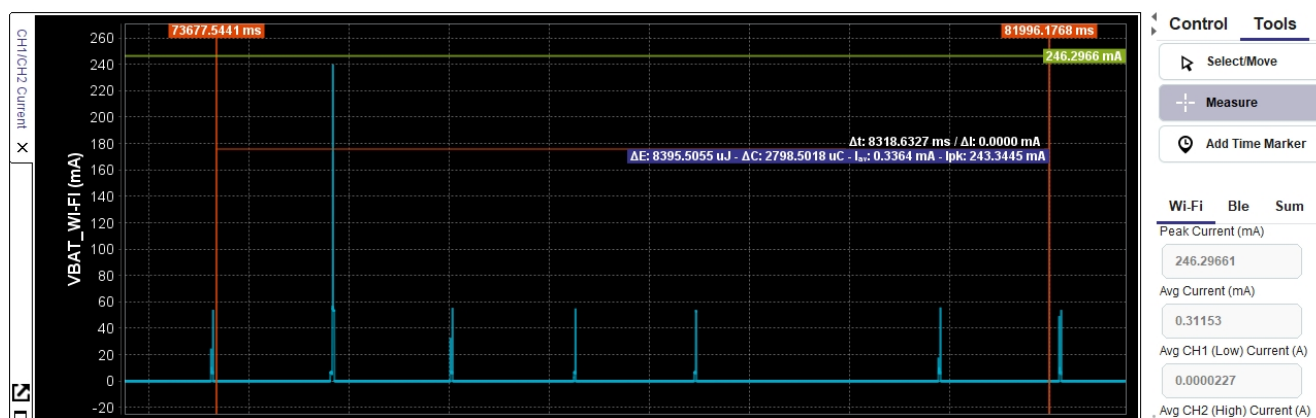


Figure 44. Measurement points

4.2.3 Measure with Power Analyzer

To measure the current consumption with Power Analyzer:

1. On the Power Analyzer, select the current measurement mode.
2. Connect jumpers between the pins and connect the current measurement points to the power analyzer, see [Figure 45](#).

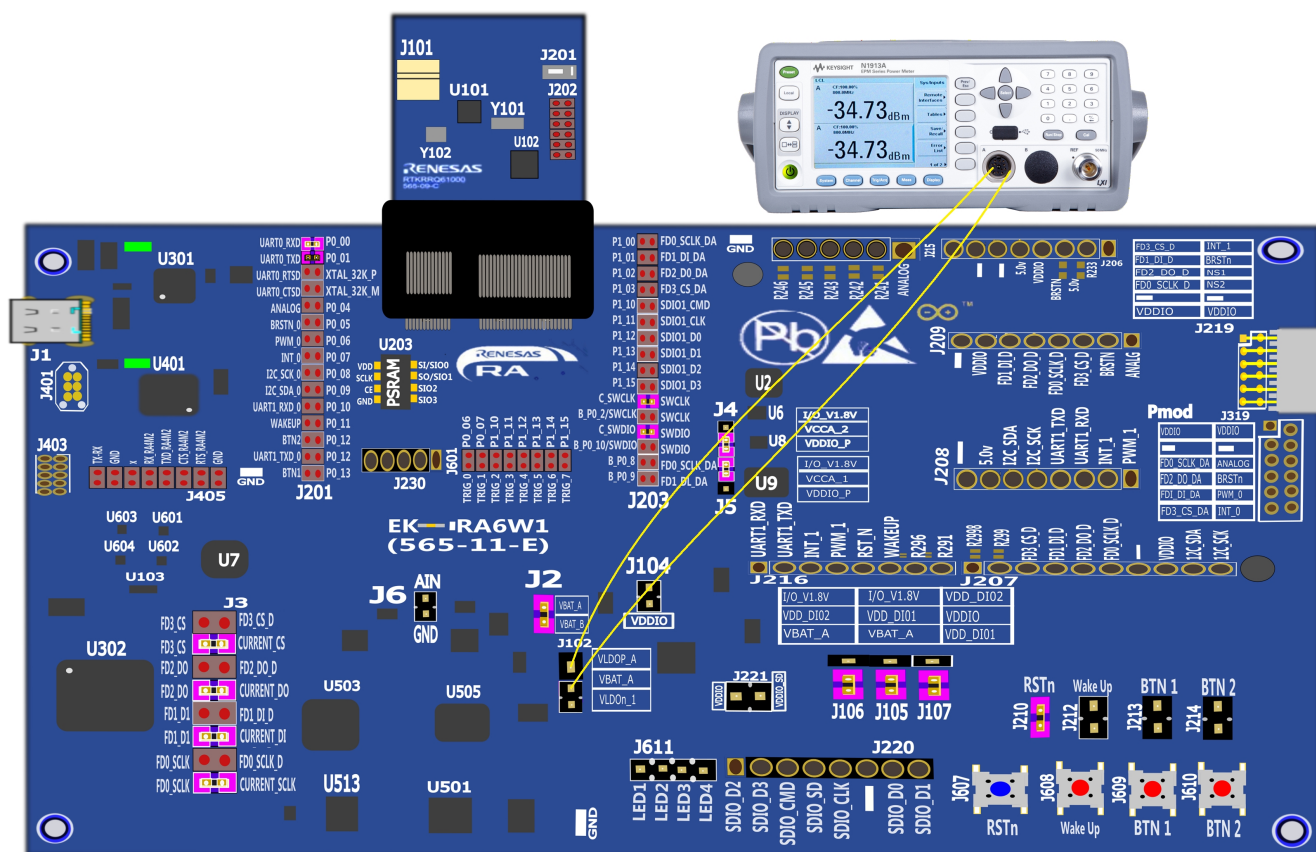


Figure 45. Jumper connections between pins

3. Assemble the daughterboard to the motherboard and turn on the EVK by connecting it to your computer through USB C.
4. Connect to the console through UART using Tera Term, see [Section 3.2 Configure RA6W1 EVK Serial Debug Interface](#).
5. In the UART console, select the needed configuration:

Example:

Configure the RA6W1 as in **Station + DPM mode** (for details on Station mode with DPM, see *RA6W1/RRQ61001 Application Development Guide*).

//OR//

Enter forced Sleep modes (2 or 3) by using the following command syntax: "pmgr force <mode>"

```
pmgr force PMGR_LLD_POWER_MODE_SLEEP2
```

6. Perform measurements with the power analyzer:



4.2.4 Measure Sleep 1 Current Consumption

To measure the current consumption for Sleep 1 follow the same process as in [Section 3.3.2 Setup for Station Mode](#). You do not need any configuration in the CLI.

The following modifications are needed in the test setup to force the device to Sleep 1 Mode:

1. Remove the J210 jumper on the motherboard.
2. Connecting a jumper between the GND and J210 RST N pins.



Appendix A AT Command Wi-Fi Provisioning

You can provision the Wi-Fi connection using AT commands through the AT command terminal. For AT command interface configuration, see [Section 3.2.1 Configure RA6W1 EVK AT Command Interface](#). To provision a Wi-Fi connection, complete the following steps:

1. To see nearby APs, enable echo output and then initiate a Wi-Fi scan.

```
ATE
AT+WFSCAN
```

2. Configure the desired Wi-Fi connection with the following command:

```
AT+WFJAP=<SSID>,<Security>,<Encryption>,<Passphrase>
```

- <SSID>: AP SSID
- <Security>: Security protocol. 0 (OPEN), 1 (WEP), 2 (WPA), 3 (WPA2), 4 (WPA+WPA2), 5 (WPA3 OWE), 6 (WPA3 SAE), 7 (WPA2 RSN and WPA3 SAE)
- <Encryption>: 0 (TKIP), 1 (AES), 2 (TKIP+AES)
- <Key>: Passphrase. 8 ~ 63 characters are allowed

Example:

If selecting Dlink_AP_24G_FZ, the configuration selected should be as follows:

- <SSID>: Dlink_AP_24G_FZ
- <Security>: 4 for WPA+WPA2 Security protocol.
- <Encryption>: 2 for TKIP+AES encryption.
- <Key>: 12345678 (password of AP).

The example of the command: AT+WFJAP=Dlink_AP_24G_FZ,4,2,12345678

The RA6W1 reboots and connects to the given SSID, with DPM enabled by default.

The procedure is similar for a 5 GHz connection. In this example, the only changes are to <Security> (changed to WPA3), and <Encryption> (changed to AES).

```
AT+WFJAP=R15-5G,6,1,12345678
```

The additional useful commands for Wi-Fi configuration:

```
AT+WFSTAT // for getting the Wi-Fi configuration.
ATF       // for factory reset
```

5. Revision History

Revision	Date	Description
1.00	July 21, 2025	First release. Content was previously part of <i>RA6W1 Getting Started Guide</i> .